

An Ecological Survey of the larger Mammals of Peninsular India

BY

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(With forty-nine plates)

[Continued from Vol. 69 (2) : 351]

THE CHINKARA *Gazella gazella* (Pallas)

(Summary of field notes : Observation records : 5.

Locations : Andhra Pradesh—Kawal Sanctuary ; Bihar—Rehal, Karkatnagar ;
Madhya Pradesh—Shivpuri National Park.

No photograph).

During the survey period no visits could be made to the ravine-cut plains jungles inhabited by chinkara, and no special attempt was made to see them except for a brief trip to Karkatnagar via Rehal. The Deccan, where I had seen chinkara prior to 1959, was not visited at all. I saw chinkara twice in Bihar during night drives, mere fleeting glimpses, and had a similar fleeting glimpse of a buck in Shivpuri, also during a night drive. I also saw them twice in the same forest in the Kawal Sanctuary, by day (A.P. 68 November 10 ; B 69 February 27 and March 2 ; MP 69 March 31).

Size : Morphological characters

Prater provides a full account of size and morphological characters.

Distribution

In the Kawal Sanctuary, I saw chinkara in heavier forests (teak forests) than they usually inhabit. The present distribution of the animal, when it has been so severely affected by hunting and is locally extinct in many of its former haunts, needs to be investigated.

THE BLACKBUCK *Antilope cervicapra* (Linnaeus)

(Summary of field notes : Observation records : 30.

Locations : Tamil Nadu—Guindy Park, Point Calimere Sa. ; Orissa—Bhetnoi near Aska ; Madhya Pradesh—Kanha N.P.

Photographs : TN 50, TN 57, MP 1, MP 39).

This is an animal whose disappearance from the plains forests of the South I have actually watched. In my boyhood it was common

in the many stretches of scrub jungle around Madras, in small herds, sometimes in herds of over 50 : except in and around the Raj Bhavan at Guindy, where it is protected, it is now locally extinct in all these areas, and most of them have been reclaimed for agriculture, industrial enterprises, and other human purposes. Blackbuck in fairly large herds were known around the site of the Tungabhadra Project in the forties, but are now extinct there, having been shot out and snared.

Although this is a report which does not concern itself with past faunal history, it is necessary to briefly refer to the sustained massacre of blackbuck that has led to its present extinction in many parts of the peninsula, particularly in the Deccan and in South India.

Being an animal of the open plains, the blackbuck was most exposed to every form of hunting by every kind of hunter, for its haunts were often close to cantonments and barracks, small towns, and rural settlements. Everyone who has handled a gun in India within the past two centuries has probably shot blackbuck, for it was the commonest 'game' animal and an animal whose hunting resulted both in a trophy (as often the skin of the doe as the horns of the buck) and in much-fancied meat. When sustained shooting made the buck wary of men, the hunters stalked their quarry under cover of a bullock cart, and later shot it from motor vehicles. Thousands of buck were shot every year, and more, perhaps, wounded. No Indian animal has suffered more at the hands of sportsmen.

When cultivation spread to the open scrub, an additional reason was found for shooting buck, as crop-raiders. Nor was the hunting of these animals limited to those with guns. Professional meat-hunters, using snares and similar devices, have probably accounted for more buck even than sportsmen. In fact, in the Tungabhadra area, it was the snare rather than the gun that finished off the local buck.

Nooses with slip-knots, usually made from the dried and stretched Achilles tendon of buck, were set staked to the ground in patches of the wild bitter-gourd, the fruit of which is greatly fancied by buck, and the animals caught by a foot were killed hours, may be even days, later. A specially cruel and effective means employed to immobilise blackbuck, practised all over the northern half of its range in the peninsula, is to insert a very sharp iron hook, something like a giant fish-hook, skilfully through the mark left by the stalk of a ripe bael fruit, so that it is entirely buried in the pulp within ; a thin, tough string, about 8 inches long, is attached at one end to this hook and the other end is tied to the middle of a sliver of hard-wood, shaped somewhat like a pencil and about the same length—the pencil and string are outside the fruit and the hook within. The bait is then left on the ground in areas known to be frequented by buck. The buck picks up the ripe fruit in its mouth and bites hard to get through the rind to the pulp within : this drives the point of the hook into its palate or the inside of a cheek,

and instantly it paws at the pencil and string hanging out of its mouth with a forefoot, to get rid of the fruit which it cannot just spit out : this results in the pencil getting firmly lodged in the cleft between the hooves of the forefoot, and when this happens the devilish contraption succeeds in completely immobilising the animal, for every movement of the foot only drives the hook deeper in, and caught by its forefoot held to the mouth, it cannot use its muzzle to dislodge the sliver of wood from between the cleft in its hoof. It falls helpless to the ground, and then the hunter comes round in the course of his inspection of the grounds he has baited, and kills it.

Blackbuck are now extinct in most of the places where they were well known only 40 years ago, especially in the middle and south of the peninsula.

Long known to humanity in the plains, and notable for their beauty, grace and speed, blackbuck have separate names for the male and the female in most Indian languages. In Tamil, for instance, blackbuck are termed 'kalai-maan' generally, and the buck is termed 'kalai' and the doe 'pulvaai' : Prater is at fault for once in giving some new-fangled Tamil name for blackbuck which seeks to distinguish between antelope and deer, a distinction that does not obtain in Indian languages.

Size : Morphological characters

Blackbuck are said to attain their best development in north India, in Rajputana and the Punjab. They are definitely smaller in size in the south-eastern part of the peninsula than in the central and north-western areas. The male is larger than the female and a big buck stands 32 inches high and weighs around 90 lb (Prater). Prater is incorrect in saying that in South India the adult buck are usually not black but a deep brown. In South India, too, the adult buck are a rich black as a rule, but a few adult males may remain a dark, grizzled colour.

The dark colour of the adult buck is notable, for it is largely diurnal and often lies up in the open during the hottest part of the day (MP 69 March 10).

Distribution

This exclusively Indian and prettiest of all antelopes had an all-India distribution in the plains till comparatively recently, inhabiting even the drier and more open scrub where many other animals with an all-India distribution (like the chital and the sloth bear) are not to be found. Being so heavily and systematically hunted, it has become locally extinct in most of its former haunts and its present distribution is scattered and in need of reassessment. It is now extinct in many of the black-cotton-soil tracts of the Deccan where formerly it was abundant, and also in most of its former haunts elsewhere in the peninsula. It inhabits

coastal plains, along the eastern coastline, such as around Chilka Lake, Madras City and Point Calimere, but it is not to be found along the western coastline. It is basically an animal of the drier and more open plains scrub, and deprivation of territory by human occupation of its home has contributed as much as the gun or the snare to its decline.

Although man has been probably the most potent influence in the decline of blackbuck, it is significant that two of the major natural predators that used to inhabit its haunts along with it, the cheetah and the plains wolf, have both become extinct (the cheetah totally and the wolf locally) in those areas even ahead of the blackbuck.

Blackbuck do not inhabit dense forests or hilly country. An isolated population existed, or still survives in small numbers, immediately outside the Masinagudi area of the Mudumalai Sanctuary, on the north-eastern slopes of the Nilgiris where they flatten out into plains country.

Habits : Behaviour

It is noteworthy that in Bhetnoi near Aska in Orissa, rural sentiment has protected blackbuck for generations, although this is mainly an agricultural village. Inquiry of the villagers elicited the information that loss to crops from blackbuck was negligible : in Point Calimere, too, I was told that it was the pig and the chital that inhibited agriculture and not blackbuck. These instances will show to what extent a taste for buck-flesh lay behind the killing of blackbuck as crop-raiders all over India.

Besides short grasses and herbs, blackbuck eat a variety of creepers that spread along the ground in patches (such as *Ipomoea* spp.) and eat the foliage and fruits of many plants of the Cucurbitaceae. I have seen, necessarily from a great distance and through glasses, blackbuck scraping at soft soil with their forefeet and muzzle to get at the underground parts of some plant, and believe stolons, rhizomes and bulbs are also eaten. They drink regularly where water is available, as at Guindy Park, but seem to be able to do with little water where freshwater is scarce, as around Chilka Lake and at Point Calimere in summer.

Vision is the chief sense, and is very keen. Blackbuck have good night vision (TN 68 June 8) and are often abroad and feeding at night (MP 69 March 10, 70 March 12). However, they are mainly diurnal, and creatures of the sun. At night they lie down in groups in open ground where they cannot be surprised from cover, and piles of their droppings mark such resting places.

Blackbuck are the fastest long-distance runners in the world. Their habit of taking a few stiff-legged vertical leaps at the start of a run is well-known, and probably serves to enable them to see the country ahead before settling down to a bounding gallop. Once, I was in a motor vehicle kept going at top speed over very flat ground, and a herd of

blackbuck kept easily ahead of us though we were going at about 40 mph, at times at 45 mph : after 3 miles we had to slow down as the ground became somewhat uneven, and the buck raced on ahead.

Jackals seem to be the chief predators that blackbuck have to contend with today. They take newborn and very young animals. These very young blackbuck are given to crouching, neck stretched in front (like barasingha) when approached : the mothers run away.

THE FOURHORNED ANTELOPE or CHOWSINGHA

Tetracerus quadricornis (Blainville)

(Summary of field notes : Observation records : 4.

Locations : Tamil Nadu—Mudumalai Sanctuary near Markundarai Betta ; Andhra Pradesh—Pakhhal Sanctuary ; Bihar—Hazaribagh N.P.

No photograph).

The chowsingha, small-sized, localised, largely nocturnal and given to lurking in the undershrub of the forests it favours, was probably missed much oftener than seen during the survey period. It is one of those animals that one gets to know when residing in the area it inhabits, rather than during brief visits to such areas, and I know it well.

Size : Morphological characters

The chowsingha is roughly the size of a muntjac or a chinkara, about 26 inches high and weighing around 50 lb. The coarse, furry coat has a greyish tinge to its brown, distinct from the chestnut sheen of the muntjac, and it does not have the dishface and prominent black tail of the chinkara, but nevertheless, occurring as it does in forests where both these other animals are found, it is often mistaken for one of them, especially as colours are not clearly appreciated at night by artificial light.

This animal, which differs in certain anatomical particulars from other (true) antelopes, has more the habits of forest living deer than of antelopes, and is unique in being the only wild animal in the world with four horns : the does are hornless, but in the male, in addition to a pair of keeled spike horns on top of the head (where horns are normally located in antelopes) there is a pair of small horns just below, above the forehead, often reduced to mere horny buttons. Its nearest relatives are to be found in Africa.

Distribution

The chowsingha is uniquely Indian, and confined to peninsular India, somewhat capriciously distributed within this vast area in hilly tracts—it favours hilltops, particularly plateaus, and foothills, where there is plenty of grass and an assured supply of water : it is a thirsty animal and drinks regularly.

Habits : Behaviour

The chowsingha is usually seen by itself or in a pair, but occasionally in a party of from 3 to 5 or 6 (B 68 April 17). I saw the animal in April 1968 in the Hazaribagh National Park, but not in February 1969 and February 1970, though I kept a sharp lookout for it in both years. It could be the chowsingha shifts ground with the onset of summer, but they also seem, like muntjac, to remain more or less in the same forest area.

The chowsingha has quite exceptional leaping abilities.

THE NILGAI

Boselaphus tragocamelus (Pallas)

(Summary of field notes : Observation records: 12.

Locations : Andhra Pradesh—Eturnagaram Sa. ; Maharashtra—Taroba N.P.; Bihar—Hazaribagh N.P. ; Madhya Pradesh—Shivpuri N.P., near Mukhavlei, Bastar.

Photographs : MP 24, B 30).

Areas where nilgai are fairly common in Bihar and Madhya Pradesh were not visited during the survey period. No sustained observation was possible, all sight records being limited to fleeting or less fleeting glimpses, usually from a distance. A determined effort to observe or at least sight nilgai in the Kawal Sanctuary was unsuccessful (A.P. 68 November 7 to 11). Nilgai were seen, singly, in Eturnagaram and Taroba N.P. (A.P. 68 January 16 ; MR 68 November 18, 20; 69 November 17). A small herd of about 6, including a big bull was frequenting the sandy nullah near Pokharia gate in the Hazaribagh N.P., and some members of this party were seen thrice (B 69 February 8 and 14, 70 February 15 : photograph B 30) : nilgai seem fairly common in the Shivpuri N.P. of M.P. (MP 69 March 31 : photograph MP 24, April 3 and 4), and a party of 3 adult cows was seen in Bastar (MP 70 March 27). They were seen both by night and by day.

In view of the paucity of personal experience of nilgai, a note on it here is not justified. However, I may add that the description and depiction of the animal as having a short tail with a thick, black terminal tuft of hair is not quite correct. The short tail is dorso-ventrally flattened and the black hair grows thickly along the edges of the terminal third of the tail, forming a brush : the tail is raised vertically above the back under excitement.

THE HARDGROUND BARASINGHA

Cervus duvauceli branderi (Pocock)

(Summary of field notes : Observation records : 45.

Locations : Madhya Pradesh—Kanha National Park.

Photographs : MP 2, MP 13, MP 14, MP 19, MP 20, MP 21, MP 22, MP 27, MP 28, MP 31, MP 32, and MP 36).

The vulgar name provided here may be briefly explained. Since the name 'barasingha' is also applied to the Kashmir stag or hangul, it may seem advisable to prefer the name 'swamp deer' for both subspecies of *Cervus duvauceli*, as Prater has done. The name, while eminently applicable to the subspecies inhabiting marshy tracts in Uttar Pradesh and Assam (*C. duvauceli duvauceli*) seems misleading when applied to the subspecies found in Madhya Pradesh, and to qualify 'swamp deer' with the adjectival 'hardground' to distinguish *C. duvauceli branderi* is a literal contradiction in terms. Since this report is confined to the peninsula where only this last subspecies is found and where the Kashmir stag is not found, the name 'hardground barasingha' seems specific and descriptive, and has been used.

Schaller provides an account of a detailed and deep study of this deer in the Kanha National Park (the area in which I observed it), and for this reason only a few observations need be detailed here.

Although smaller than the sambar and with quite distinctive antlers, and larger than the chital and with different antlers, I have known the barasingha confused with both in Kanha. From a distance visual assessment of size is not reliable, especially in open ground. The best way is to aid vision with glasses.

All barasingha seen in Kanha were observed in March 1969 and 70, and early in May 1968, when the stags had not yet shed their antlers here, and had ragged coats, with the hair of the winter coat coming off in matted strips and bunches. Some stags were dark brown in colour, a vandyke brown, but most were only a little darker than the hinds. Four stags lying down in the shade were attended on by crows, which plucked the hair off the neck of two stags in beakfuls, the stags offering no resistance to this attention : the crows were not using the matted hair for nesting, nor did they seem to have any object in indulging in this hair-stripping—they plucked out a beakful of hair, tossed it onto the ground, and then plucked out another beakful. After 7 or 8 beakfuls had been removed in this manner, both the stags tossed their antlers and chased away the crows (MP 70 March 13).

The stags seemed to have developed a certain brittleness of horn by March, about 2 months before shedding their antlers (late May-June). One stag had the right brow tine broken off clean at the base, where it joined the beam, a flat, oval, bone-white scar marking the cleavage

(MP 69 Mar. 13 : photograph MP 21) : another stag broke off a tine from the rack on top of the beam in between March 17 and 22, 1970, and had a similar flat, white, oval cleavage mark at the joint of the tine with the beam (MP 70 Mar. 23).

Although by March the breeding season is said to be over, one stag was seen displaying sexual interest in a hind, smelling at her hindquarters and smelling her urine and curling up the lips with the muzzle pointing up. No bugling was heard.

In March 1970 two big stags, not seen during previous visits to Kanha (in May 1968 and March 1969) were noticed. One was a 12-pointer with a coat only a little darker than a hind's and with well-developed antlers of the typical barasingha pattern, with the tines bone-white for their distal half : the other was a remarkable specimen, a little smaller in the body than the 12-pointer but sturdily built and dark brown, with rugged antlers, heavy enough and sufficiently beaded to have been notable on a sambar stag : the beam was rather straight, and the rack of tines on top numerous on somewhat palmate forks—the many snags made counting the total number of points difficult, though on several occasions he was closely observed, the difficulty being in determining what was a tine and what a mere burr or small snag : however, by any count this multipointer had upwards of 20 points (MP 70 Mar. 8, 12, 13, 19, 21, 22, 23 : photographs MP 27, MP 31 and MP 32—there are several other pictures of this multipointer taken to show his antlers from different angles in big blow-ups, which could not be included here because the details are not clear in small prints).

This multipointer was usually seen in the company of the big 12-pointer and sometimes along with two fully adult but lesser stags, a fine 10-pointer and a small, back-going 12-pointer, in a small stag-party of 4, and also in a herd with hinds, brockets, and young. The multipointer was obviously the most dominant stag in Kanha in March 1970 : the big 12-pointer took precedence after him, then the 10-pointer, then the 12-pointer : photograph MP 32 shows all the 4 stags together. No sparring between these stags was noticed, but once the two lesser stags locked horns for a few seconds in a desultory, brief bout of sparring. The head-up display was used by the two larger stags, towards the other two, and by the multipointer towards the big 12-pointer. It was noticed that when on the move both the big stags used a threat with the antlers lowered to direct a lesser stag in the lead. What can only be described as a sideways glare was also used as a threat or direction : in chital, such ocular displays are common. Among hinds, too, the head-up display was freely used (MP 69 Mar. 16 : photograph MP 19), but no head-down display (used by chital and sambar stags in intimidation) was observed. Two hinds indulged in a mutual head-up display which was developed into their rising in the air on their hind legs and slashing

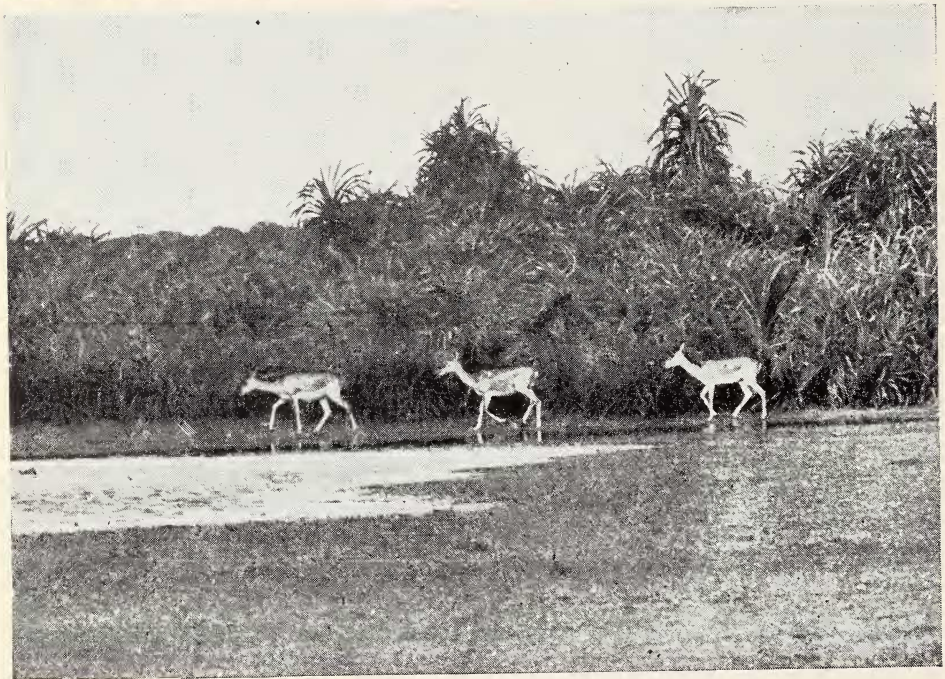
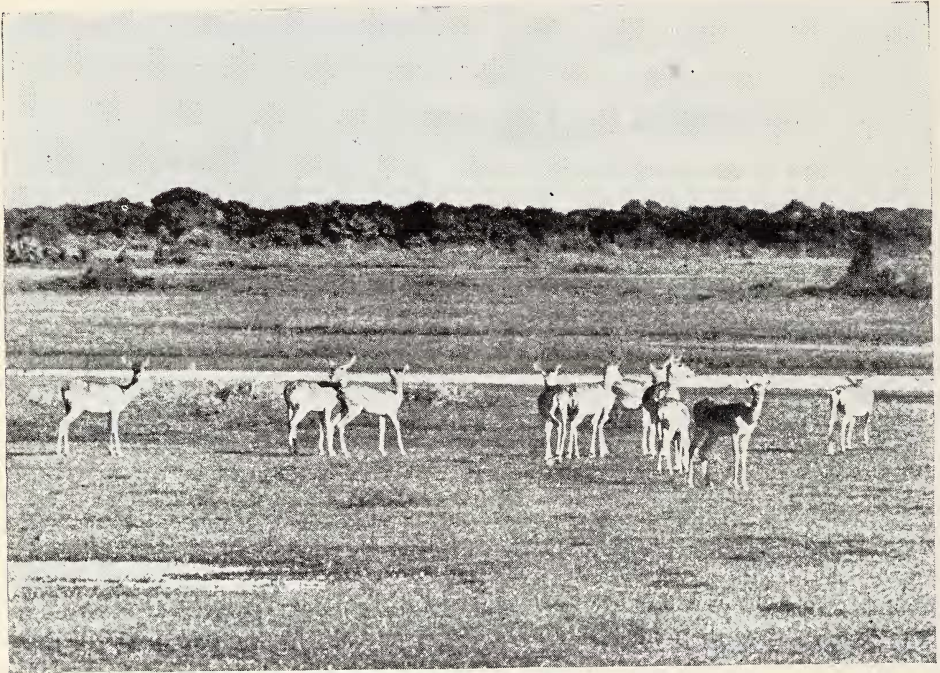
Krishnan : Mammals



Above : M.P. 1968 : KANHA N.P. : May 1 — a.m. : A string of 11 blackbuck — MP. 1 ;
Below : M.P. 1970 : KANHA N.P. : March 22 — a.m. : The 6 male blackbuck — MP. 39.

(Photos : M. Krishnan)

Krishnan : Mammals



Above : TAMIL NADU 1968 : PT. CALIMERE : December 16 — a.m. : Blackbuck does — TN. 50 ; *Below* : TAMIL NADU 1969 : PT. CALIMERE : December 15 — evening : Blackbuck does against screwpine — TN. 57.

(Photos : M. Krishnan)

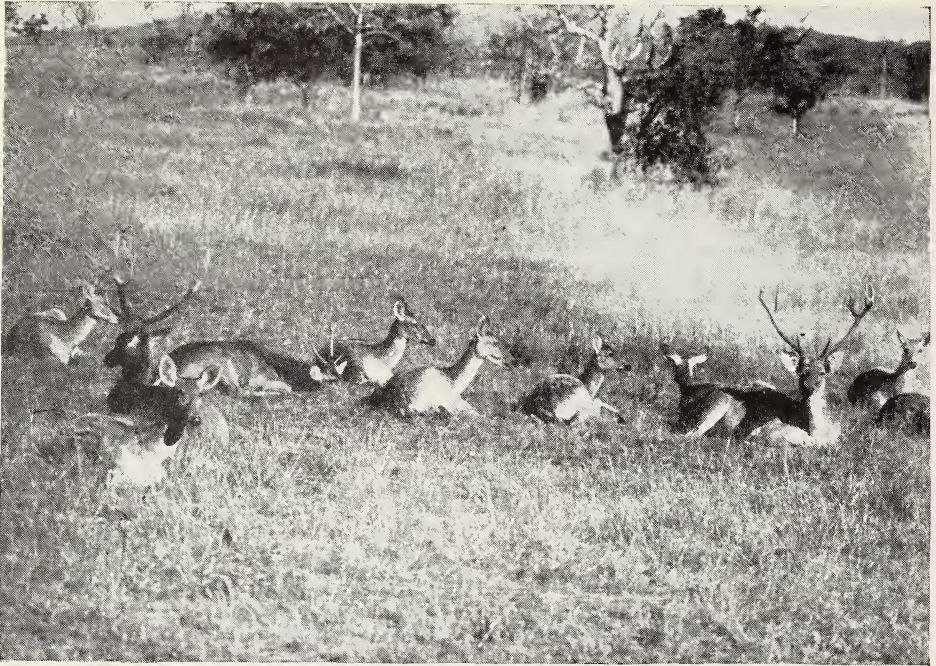
Krishnan : Mammals



Above : M.P. 1969 : SHIVPURI N.P. : March 31 — 10 p.m. : Subadult nilgai bulls — MP. 34 ; *Below* : BIHAR 1970 : HAZARIBAGH N.P. : February 15 — about 3.30 p.m. : Bull nilgai — B. 30.

(Photos : M. Krishnan)

Krishnan : Mammals



Above : M.P. 1968 : KANHA N.P. : May 1 — a.m. : Part of a herd of barasingha lying up. Note two 12-pointers, and the brocket lying with neck outstretched — MP. 2 ;
Below : M.P. 1969 : KANHA N.P. : March 8 — a.m. : Part of the herd of 47 barasingha — MP. 13.

(Photos : M. Krishnan)

Krishnan : Mammals



Above : M.P. 1969 : KANHA N.P. : March 8 — a.m. : The master stag of the herd in picture MP. 13 : a 12-pointer — MP. 14 ; *Below* : M.P. 1969 : KANHA N. P. : March 16 — p.m. : The 'head-up' display — MP. 19.

(Photos : M. Krishnan)

Krishnan : Mammals



Above : M.P. 1969 : KANHA N.P. : March 17 — a.m. : Barasingha stag in his third year — MP. 20 ; *Below* : M.P. 1969 : KANHA N. P. : March 18 — a.m. : The barasingha stag with the right brow-tine broken — MP. 21.

(Photos : M. Krishnan)

Krishnan : Mammals



Above : M.P. 1969 : KANHA N. P. : March 19 — a.m. : 2 barasingha hinds fighting — MP. 22 ; *Below* : M.P. 1970 : KANHA N. P. : March 8 — a.m. : The multi-pointer and 10-pointer lying down, with the rest of the herd grazing — MP. 27.

(Photos : M. Krishnan)

Krishnan : Mammals



Above : M.P. 1970 : KANHA N. P. : March 11 — a.m. : Barasingha hind and fawn — MP. 28 ; *Below* : M.P. 1970 : KANHA N. P. : March 13 — a.m. : The big 12-pointer, the lesser 12-pointer and the multi-pointer — MP. 31.

(Photos : M. Krishnan)

Krishnan : Mammals



Above : M.P. 1970 : KANHA N.P. : March 19 — 10 p.m. : Barasingha lying up in tall grass — M.P. 36 ; *Below* : M.P. 1970 : KANHA N.P. : March 13 — a.m. : All the 4 big Swamp Deer stags together. Probably the finest of their kind left — M.P. 32.

(Photos : M. Krishnan)

Krishnan : Mammals



Above : MAHARASHTRA 1969 : TAROBA N.P. : November 23 — 7 p.m. : Subadult sambar licking block of salt, near Chital Road — MR. 13 ; *Below* : BIHAR 1969 : HAZARIBAGH N.P. : February 12 — 6 a.m. : Sambar stag with an antler just shed — B. 6.

(Photos : M. Krishnan)

Krishnan : Mammals



Above : BIHAR 1969 : HAZARIBAGH N.P. : February 14 — 8 p.m. : Sambar hind and fawn — B. 8 ; *Below* : BIHAR 1970 : HAZARIBAGH N.P. : February 3 — about 8 p.m. : A sambar stag (about 3 years old) chewing the cud, standing — B. 22.

(Photos : M. Krishnan)

Krishnan : Mammals



Above : BIHAR 1970 : HAZARIBAGH N.P. : February 6 — midnight : Sambar stag — B. 24 ; *Below* : BIHAR 1970 : HAZARIBAGH N.P. : February 8 — 8 p.m. : Sambar hind and 2 brockets at the lick — B. 25.

(Photos : M. Krishnan)

Krishnan : Mammals



Above : BIHAR 1970 : HAZARIBAGH N.P. : February 9 — 6.30 p.m. : Sambar hind and fawn — B. 26 ; *Below* : BIHAR 1970 : HAZARIBAGH N.P. : February 9 — 7 p.m. : Sambar stag, near suspended block of salt (not shown) — B. 27.

(Photos : M. Krishnan)

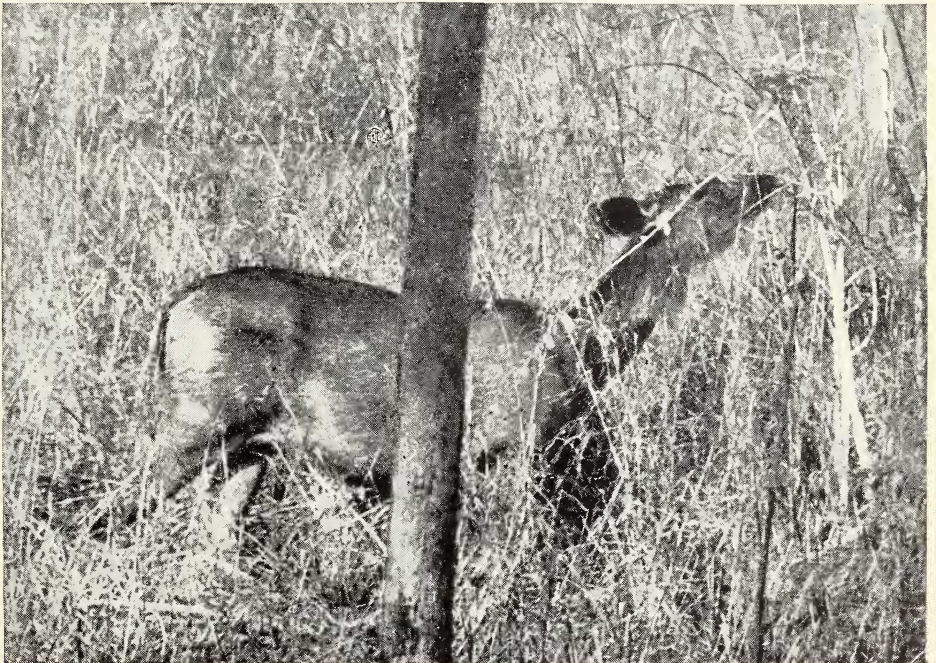
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Above : BIHAR 1970 : HAZARIBAGH N.P. : February 12 — about 6.15 p.m. : Sambar stag rolling in the mire — B. 28 ; *Below* : BIHAR 1970 : HAZARIBAGH N.P. : February 12 — 10.40 p.m. : Head of an old stag : picture out of focus, but still shows the robust development of the brow-tines — B. 29.

(Photos : M. Krishnan)

Krishnan : Mammals



Above : TAMIL NADU 1959 : MUDUMALAI SA. : Kargudi : March 15 — a.m. : Sambar hind, looking back at me — TN. 2 ; *Below* : TAMIL NADU 1962 : MUDUMALAI SA. : Kargudi : March 13 — a.m. : Sambar hind eating nelli — TN. 8.

(Photos : M. Krishnan)

Krishnan : Mammals



Above : TAMIL NADU 1962 : MUDUMALAI SA. : Kargudi : March 21 — a.m. : Sambar hind and fawn : Note sore-patch — TN. 12 ; *Below* : TAMIL NADU 1962 : MUDUMALAI SA. : Kargudi : March 24 — a.m. : Gravid sambar hind with extensive sore-patch — TN. 14.

(Photos : M. Krishnan)

at each other with their forelegs (MP 69 Mar. 19 : photograph MP 22).

On occasion barasingha were heard indulging in their hysterical, baying alarm, sustained over several minutes (MP 68 May 3, 69 Mar. 7 & 8) : perhaps a tiger was the cause of the excitement, the chorus of many deer baying sharply developing into a frenzied crescendo of short, high-pitched yappings : on the latter two occasions, towards the end of the baying of the barasingha, the sharp alarm calls of chital were heard in accompaniment.

Barasingha hinds indulge in a 'conversation' with one another, very much in the manner of chital hinds in a herd when in cover, but less fluently and with less variation to their mewling call. This call is a soft, long-drawn, plaintive mewling sound, not audible from a distance, and not broken up into syllables but modulated—a long 'Chchaaai' ending on a thin, querulous note. A herd of 13 barasingha split into two parties, one of 6 and one of 7 : later, the oldest hind in the party of 7 which was grazing in a nullah, came out of the nullah and crossed the open ground beyond, coming out with repeated mewling calls : 2 hinds (probably belonging to the party of 6) came up across a rise towards her, also coming out with this mewling call : the leading newcomer came up to the old hind with neck outstretched and sniffed at the head of the older hind who, thereupon, rose on her hindlegs and pawed the air right in front of the newcomer's nose with her forefeet, in what was evidently a threat. The newcomer backed a step but maintained the stretched-neck attitude which, evidently, was submissive or placatory, and then the 2 new hinds joined the party of 7 (MP 69 Mar. 16). Once I had a quite exceptional opportunity to listen to the mewling intraspecific calls of barasingha and chital at the same time and from the same spot, both the deer being equidistant from me, about 50 yards away : the barasingha's mewling call was softer, less varied and less audible (MP 70 March 21).

A mother and her young fawn (about 6 months old or younger) were observed licking each other (photograph MP 28).

Parties and herds were observed lying up in the tall grass of a nullah, some standing and some lying down : herds also lay down in an open maidan when it was cloudy and not too hot : at night the barasingha were seen lying up in the grass close together, in a herd (MP 70 Mar. 7, 8, 19 and 23 : photographs MP 27 and MP 36). A large herd was seen in the water at Sravantal (MP Mar. 8).

A sharp lookout was kept for stag parties, but though several such parties were seen, none was large : no stag parties of over 10 animals or so were seen, and even in Assam where I saw larger stag parties (of *Cervus duvauceli duvauceli*, in the Kaziranga Sa.) nothing like the large stag parties of chital seen in the Masinagudi area of the Mudumalai Sa. was noticed. The largest congregations were mixed herds, consisting

mainly of adult hinds, with a few fawns, a few yearlings, and a very few adult stags or only a few brockets : herds of about 50 (1 adult and 2 young stags), 33 (no adult male), 47 (one dark adult stag, 2 younger stags, 3 brockets, 9 animals well under one year, rest hinds), and 32 (mainly adult hinds, no adult stag) were seen (MP 68 May 1, 68 May 5, 69 Mar. 8, 70 Mar. 17: photographs MP 2, MP 13).

The most striking characteristic of the barasingha seen in Kanha was their lassitude, as compared to other (marshland) barasingha seen in U.P. and Assam. No doubt at Kanha they are used to the sight of men, and because of this, and also because of the general tendency of animals to permit a close approach when men are in a motor vehicle or on elephant back (and not on foot), they permit one to get quite close, but making allowance for all this, I was still struck by their lassitude, and did not think it merely familiarity with men—in this connection, it is worth remembering that the barasingha at Kanha do not stay in the meadow round the year, and that they come in from all round and that Schaller thinks poaching is partly responsible for the decline in their numbers—it is my experience that animals hunted or harassed are never unduly trustful of men. Schaller thought to high mortality among infants he noticed was probably due to brucellosis, and it could well be the lack of wariness and vivacity I noticed was also caused by the debilitating effects of the infection.

The population evaluations of barasingha at Kanha park are based on the deer visiting the meadow during summer. The deer seem to arrive here from many places around, and although the population in the meadow substantially represents the total population in and around the park, a few may go elsewhere (to places not known at present); the arrival of the multipointer at Kanha in March 1970, when he was not there in 68 and 69 suggests this, *if* the antlers he carried in 1970 were representative of those he carried in 1968 and 69. Anyway, the survival of the hardground subspecies of barasingha is dependent almost entirely on the deer in Kanha : the isolated small herds, parties or individuals known elsewhere, as at Bastar, have small chance of survival.

Schaller thought the Kanha population totalled around 50, and that the official figures (about 100) were rather high. That may have been so for the 2 years he studied the deer here. I watched the census being taken and thought the official *modus operandi* somewhat haphazard : for example, it completely missed a herd of 19 I was watching in a nullah that day (MP 70 Mar. 7). Even if, as I think, there are about 100 animals left in Kanha today, there is little room for complacency in this number. There were several hundreds here only a few decades ago and thousands earlier, and these undoubtedly represent the last stable population of hardground barasingha anywhere. Various causes for the decline of the deer at Kanha have already been mentioned. I think (I realise that

others differ from me over this) that the artificial attraction of tigers to the Kanha meadow has definitely resulted both in the decline of the barasingha and in the decline of the tiger in this park. Whether or not this is true, everyone agrees that unless immediate steps are taken to save this particular subspecies of the barasingha, it will inevitably become extinct. A plan based on capture and release into a large stockade of a few animals, to be protected and studied, is being carried out. In 1968 I suggested a scheme for introducing fresh blood, from the marshland subspecies of U.P. : my scheme, based on genetical factors and the experience of breeders of pedigree dogs and other domestic animals (whose breeds differ much more in physical characteristics than the 2 subspecies of the barasingha do) is probably difficult of operation. Anyway it is not being pursued. With the position of the hardground barasingha so precarious, it was heartening to note a distinct improvement in the fawn and yearling ratio to adults in 1970. Whether or not this improvement will be maintained is something that only time can tell.

I do not know on what taxonomical grounds the genus *Cervus* is distinguished from the genus *Axis*, but think that barasingha in Kanha show a much greater affinity to chital than to sambar : till recently sambar too, were not included in the genus *Cervus*, but at one time it was suspected that barasingha and sambar interbred occasionally. I think that if barasingha interbreed with other deer, it is more likely to be with chital, not in the wild, but in captivity.

THE SAMBAR

Cervus unicolor Kerr

(Summary of field notes: Observation records : 200 +.

Locations: Kerala—Periyar Sa.; Tamil Nadu—Mudumalai Sa.; Mysore—Bandipur Sa.; Andhra Pradesh—Kawal Sa.; Orissa—Raigoda Sa., Usha Kothi Sa.; Bihar—Hazaribagh N.P., Palamau N.P., Tholkobad, Karkatnagar; Madhya Pradesh—Churna, Shivpuri N.P., Kanha N. P.; Maharashtra—Taroba N.P.

Photographs: K 8: TN 2, TN 8, TN 12, TN 14, TN 26, TN 35, TN 44, TN 45 and TN 59: B 6, B 7, B 8, B 22, B 24, B 25, B 26, B 27, B 28 and B 29: MP 34: MR 10 and MR 13).

The sambar was one of the very few animals seen in all the 8 States in which the survey was conducted, and it was also observed outside the survey areas. The opportunity to study it in so many diverse locations was rewarding. Although a typical forest deer, also found in hilly tracts where there are extensive belts of tall grass, it does not favour dense tree growth and is essentially a creature of the more open deciduous forests, and is found even in dry forests with little tree shade in summer. It is much more diurnal in its habits than is generally realised though it does forage by night as well, and where it is not disturbed by

men is commonly abroad by day. Its tolerance of the sun and heat are remarkable. Since this account is based largely on field observations (supplemented by photographs), in order to avoid needless length much of the information available on sambar in faunal literature (such as an account of its distribution) is not repeated here, but necessary references are specifically cited.

Size : Morphological characters

Size varies considerably with locality and strain, but the sambar is definitely the largest of all Asiatic deer and seems to attain its best development in India. Stags are taller than hinds and usually much heavier : a very big stag may stand some 56 inches high and weigh 700 lb, a small adult stag only 48 inches in height, and 450 lb in weight, or even less. There is no direct correlation in stags between body size and antler development : some very big stags may carry comparatively poor antlers, and some medium-sized ones exceptionally well-developed antlers. There is a distinct trend towards small body size in the drier and more open forests, especially those in the plains, and generally speaking sambar are smaller in the southern parts of the peninsula than in the northern parts. The most magnificent body development seems to be attained in the north-western areas of Orissa, on the Bihar border, and in Bihar near that border and in certain other areas such as Hazaribagh, and some stags of the most impressive size were seen in Badrama, Singhbhum, and Hazaribagh (O 69 Jan. 27; B 69 Feb. 4 and 5/6, 68 Apr. 17, 68 Feb. 12, 70 Feb. 2 and 13) ; a peculiarity of these big stags is the robust development of the brow tine—though the antlers may not be notably long, they are heavy and well-beaded in the beam and the brow tines are notably long and heavy (O 70 Jan. 25; B 68 Apr. 17 and 70 Feb. 12 : photographs B 24 and B 29). A mounted head at the rest-house at the Usha Kothi Sanctuary (Badrama) was only 33 inches long measured along the curve but very thick and with the brow tines heavy and fully 16 inches long : another mounted head at the Forest Training College in Champua, near the Bihar border, was 40 inches around the curve from base to tip of the outer tine of the beam and the brow tines were 18 inches long : a comparison of the length of these with those of antlers from other parts of India shows that in parts in Madhya Pradesh an equally notable development of the brow tines is seen in exceptionally thick antlers (Dunbar Brander) but not in other areas, and that in many antlers notable for their length (Forsyth's record head, for example) the brow tines are comparatively much shorter ; in other parts of the peninsula, the brow tines do not seem to be developed to this extent. Note that both photographs B 24 and B 29 show antlers notable only for their brow tines, and otherwise of modest length.

It is generally said that old stags are very dark, almost black. Where the winter and summer coats are notably different (as they are not in

the southern areas of the peninsula) the winter coat is usually much darker, but not always so. I have seen many old stags, even in winter coat, whose pelage was not specially dark, and some whose pelage was somewhat light, being tinged with pale raw umber. The large, obovate ears have much less hair on their insides than in barasingha or chital, and are not conspicuously white on the insides as the ears of those two deer are. There is no white on a sambar, but on the rump and the insides of the legs, especially where they join the body, and on the chin, the hair is usually much paler, a light, warm sienna or even pale ochre. The dorsal aspect of the tail is always black or a very dark blackish brown. In spite of their strong build, quite burly in adult stags, sambar are the most graceful of all deer in their movements, and run swiftly over uneven ground with surefooted ease.

Perhaps the most remarkable feature of the sambar is the wide prevalence of the sore patch in adults, a raw, red patch devoid of hair, at the base of the throat, not found in any other deer : this has been termed 'sore spot' by most writers, but is termed 'sore patch' here as the sore is not a spot but much more a patch covering the base of the throat and extending up the neck on either side when extensive. The patch is always ventral and median and usually situated at the base of the throat, though it may start as a thin vertical line of rawness a little higher up—as Dunbar Brander points out, there is a prominent whorl of hair at the throat (clearly shown in photographs B 7, B 8 and B 25—though in the sambar shown there is no sore patch) where the sore patch is situated, the whorl disappearing with the formation and spread of the 'sore'. The patch varies in size from about 2 to 10 inches in diameter, and is usually shield-shaped : in all but incipient or undeveloped sore patches, there is a white-mouthed tubercle placed below the centre, and the skin around is bare of hair and extravasated, a flesh-tint to red in colour : sometimes there is blood on the sore patch, and it is usually coated by a thin, serous exudation, which shows up when the light is strong on the patch—the sore patch is not a dry, angry-looking area of skin (TN 66 Apr. 9 : photograph TN 44). I have never seen the patch on a fawn and not often on a yearling. The sore patch is not a universal feature of sambar everywhere in the peninsula—it does not seem to occur among sambar in the Hazaribagh National Park, a faunal area specially noted for its sambar : I did not see a single sambar in the Taroba N.P. which exhibited a sore patch, in November 1968 and November 1969. In the Kanha N.P., the patch does not seem to be as extensive as it is in other parts of the peninsula, for example the Mudumalai and Bandipur sanctuaries. In the Mudumalai sanctuary, most of the adults (but not all) seen in March, April, September and October carried the sore patch.

From time to time theories have been advanced to explain the sore patch, some of them diverting. Schaller mentions most of these theories,

but not what may be termed the Abrasion Theory, i.e., the theory that the sore patch is the result of the skin at the base of the throat getting abraded in the course of the sambar's passage through hard or spiky undershrub—this theory ignores the fact that sambar living in areas where the undershrub is not hard also show the sore patch and that the 'sore' is invariably located at the same spot, and is on the ventral median line of the throat and perfectly symmetrical. Schaller himself thinks that the sore patch has a sexual significance, the exudation from it being rubbed off on the vegetation to provide scent markings in the course of the sambar's movements through cover: in fact, he argues a different breeding season for sambar in the Kaziranga Sanctuary and the Kanha N.P. on the basis of the different months in which the animals with sore patches are seen in both sanctuaries, and says that in Kanha the patch is seen invariably on adults in November-December, and only from mid-November to mid-December. I saw the vertical commencement of the sore patch on the necks of 2 adult hinds at Sravantal lick (in Kanha) in March (MP 70 Mar. 17: photograph MP 34: the flash picture clearly shows the medium vertical incipient sore patches on both hinds). Further, I do not think the sore patch has any sexual significance. I have seen it on hinds with very young fawns at their heels, when they were still in the phase of lactation and could not have been in breeding condition (TN 62 Mar. 21: photograph TN 12, TN 62 Mar. 24, Apr. 7, 66 Apr. 1 and 2), and also on a heavily gravid hind (TN 62 Mar. 24: photograph TN 14 shows the extensive sore patch), and also on stags in velvet (TN 66 Apr. 4)—quite adequate evidence of the sore patch having no sexual significance.

I agree with those that suggest a glandular basis for the patch: its location and the white-lipped mouth of the patch does suggest some glandular activity. Clearly it is nothing pathological, but normal, considering the commonness of its occurrence. Inquiry made at Hazaribagh N.P. elicited the information that at no time were sambar with flagrant sore patches seen—even outside the months of February and April when I worked in the sanctuary. Sore patches were seen in Singhbhum early in February (B 69 Feb. 5/6) and in Kanha N.P. in March.

The truth seems to be that although the sore patch is such a flagrant and remarkable feature, and uniquely confined to sambar among deer (or, for that matter, among all mammals) no work to determine its histogenesis or even periodicity has been done: seeing that sambar in confinement (as in zoos) also develop the sore patch, scrapings from the sore and biopsy should be helpful in determining its true nature.

Habits: Behaviour

Sambar vary widely in their habits and responses, being such versatile animals. However, Prater's statement that they 'retire into heavy cover at daybreak and do not usually come out till dusk' is based entirely

on the evidence of hunters to avoid whom the animals have turned nocturnal and crepuscular, and is not true : compelling evidence on this point is offered by my field notes and photographs, but to avoid needless length I am not referring to the hundred and odd occasions on which I have watched sambar by day, but am merely citing the photographs showing sambar going about their normal activities by day, in the morning, in the forenoon and in the afternoon (photographs TN 2, TN 8, TN 12, TN 26, TN 35, TN 45, and TN 59—there are dozens of other photographs, not reproduced here, showing sambar feeding or relaxing in the open, by broad daylight).

Sambar are much less gregarious than chital or barasingha, and are often seen alone, especially the stags, or in family groups of a fawn and its mother, sometimes accompanied by a yearling, evidently the adult hind's young from the previous year (TN 59 Mar. 9, Mar. 15, 62 Mar. 13, Mar. 21, 64 Mar. 19) : 2 or 3 adult stags may also be seen together (TN 63 Mar. 26, 64 Mar. 19, 66 Sep. 18) : or the deer may be seen in parties of from 4 to 8, which may or may not include an adult stag and one or two young. The largest congregation I have seen was a herd of 15 (TN 64 Mar. 23), but H. Subba Rao, the knowledgeable Range Officer of the Bandipur Sanctuary told me in October 1968 that he had seen sambar in herds of over 20 on a hill on the outskirts of the sanctuary.

A feature of the deer is that when a small party is disturbed but not alarmed, and is followed cautiously at a distance, it very often leads to another small group, and that the two join and proceed to yet another group or individual, gaining strength in this manner till a dozen or so are together, when they usually bolt. (TN 59 Mar. 12, 66 Mar. 31, 66 Apr. 3). Hinds with young fawns cache their young in tall grass, but when not alarmed and moving away go up to them and nuzzle them to get them to follow (TN 66 Apr. 7).

Sight is acute, and the ability to see small movements and even to make out stationary objects is good. I have never been able to get close to sambar by stalking them prone over open ground when the wind was in my favour, though chital can be approached in this manner. The sense of hearing is also acute, the animal being able to distinguish between normal and suspicious sounds (TN 63 Apr. 3 : photograph TN 26). Smell, of course, is the paramount sense. Sambar do not wait for visual confirmation when alarmed by scent, but when not unduly alarmed may seek it (TN 63 Mar. 17, 66 Apr. 14). During heavy rain they are evidently unable to scent and hear possible danger, and are, naturally not able to see things clearly either : at such times they stand immobile in the open instead of seeking cover (TN 62 Mar. 21, 66 Sep. 26).

The alarm call, an explosive ' dhank ! ', is sounded when the animals are sure of their ground and getaway, a forefoot being also stamped repeatedly (TN 66 Sep. 26: B 70 Feb. 17 and 24).

Leadership in a party is not necessarily determined by the criterion of which animal is in the lead. More often than not, as in most deer and even in gaur, the dominant member of the party stays more or less to the middle and directs a younger, subordinate animal to take the desired line. A bite-threat is commonly employed for this purpose, the dominant sambar moving forward towards the subordinate member of the party with the mouth held menacingly open—the general attitude of the threatening animal is also menacing (TN 64 Mar. 19, 66 Apr. 10). Once a chital hind was seen in association with a sambar hind and fawn which had, on a previous occasion, permitted a close approach on elephant back, but because the chital was apprehensive and bolted at the least move on our part (chital are apprehensive of men on elephant back and even of elephants, much more so than most other animals) the sambar also bolted with their 'guide' (TN 59 Mar. 17).

Sambar lie up in company, choosing open ground for this. The amount of heat they can stand is astonishing. They do not seem much bothered by forest fires, and a hind (with a fawn) was seen standing by freshly charred ground watching unconcernedly a forest fire close by (TN 59 Mar. 15: photograph TN 2). A party of 7 (3 adult hinds, 3 near-adult hinds and a brocket) lay down in a close group on open, charred ground directly in the afternoon sun, whose heat was oppressive (TN 64 Mar. 26). During forest fires in summer, sometimes it happens that a dead, fallen tree gets set alight, and thereafter for weeks the fire may keep smouldering in the heart of the bole, burning it out to the periphery, leaving a long, conspicuous trail of white ash (marking the burning of the tree) on the forest floor till the heavy rains wash away the ash. I had long known that sambar liked to lie down close to such smouldering fallen trees, but was unable to secure proof till 1964. In 1964, a party of sambar toasting itself close to a long-dead, smouldering *Terminalia tomentosa* was watched over several days and the field notes contain a full record of the observations (TN 64 Apr. 2, 3, 5, 7: photograph TN 35). The radiated heat by that smouldering tree was oppressive, and the sambar were basking by the fire when the sun itself was scorchingly hot! Another sambar was seen basking besides a smouldering log two summers later, in a locality far from the scene of the first record (TN 66 Apr. 7).

Dunbar Brander has pointed out that when winter mornings are frosty, sambar lie up in the water, which is warmer—they do so even in the Nilgiris. Apparently they are more sensitive to the cold than to heat.

Sambar are versatile in their feeding, browsing leaves and twigs, eating tree bark, grazing on a variety of herbs (mainly tall grasses) and consuming quantities of forest fruits. After a forest fire, they are pro-

bably the first animals to seek out the fresh sprouts of grass—other animals wait till the new grass has sprouted a little higher. (TN 59 Mar. 9). Leaf buds and tender twigs are also choosily eaten, and the foliage and twigs of *Ardisia solanacea* eaten in bulk (TN 66 Apr. 19). The foliage of *Emblica* spp. (much eaten by most herbivores), the foliage and twigs of *Grewia aspera*, *G. hirsuta*. *Hibiscus lampas* (flower also eaten), *Helicteres isora*, the fruits of *Randia dumetorum* and *R. uliginosa*, ber, *Emblica* spp., *Diospyros* spp., and figs are all eaten (TN 62 Mar. 13 : photograph TN 8, 62 Mar. 16, 64 Mar. 19). In the Taroba N.P. sambar were observed feeding on some aquatic sedge or grass and in Bandipur Sa. on *Enteromorpha intestinalis* in a forest pool (MR 68 Nov. 19, 26 : MY 68 Oct. 11).

It is said by all authorities that sambar have a definite breeding season, though this may vary with climatic factors and differ in different regions. The shedding of the antlers seasonally and the birth of young, also in a specific season, are cited as evidence of the existence of a definite breeding season, though these, too, may vary with regional variations and lie in different months in different locations. Regarding the casting off and regeneration of antlers, the evidence available is confusing. Prater says, 'In central and southern India the majority of stags cast their antlers between the end of March and mid-April' and that the new antlers are clear of velvet by November. Taking the Mudumalai Sa., as being representative of the region Prater speaks of, some stags which had just shed their antlers were seen in March-April (TN 63 Mar. 19, Apr. 8) ; many were in hard horn during these 2 months (TN 62 Apr. 6, 63 Mar. 21, Apr. 3 : photograph TN 26) : some stags were also seen clearing the velvet from fully formed antlers (TN 63 Mar. 12, 64 Apr. 11, 66 Apr. 7). Further, stags in velvet were seen in September here (TN 63 Sep. 12, 66 Sep. 18). Evidently there is no defined season for the shedding of antlers in this area.

The evidence of birth is much more cogent. Prater, evidently following Dunbar Brander, says 'the young are born at the commencement of the rains, in May or early June'. In the south of the peninsula they appear to be born earlier. A point on which my field notes are consistent in that all very young fawns seen in the Mudumalai Sa. were seen in March, and that the only fawns seen in September-October were juveniles at least 6 months old.

Wallowing, associated in deer with the breeding season, seems to be indulged in at all times in sambar and to have no special sexual connotation. A stag rubbing the velvet off his antlers was observed soon after he had wallowed in a patch of swampy ground (TN 63 Mar. 12), and another with his coat spiky from recent wallowing (TN 66 Apr. 17). A big stag was observed wallowing at the Hazaribagh N.P., at a time when there was no breeding activity (B 70 Feb. 12 : photograph B 28).